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ED 024 771 VT 004 952

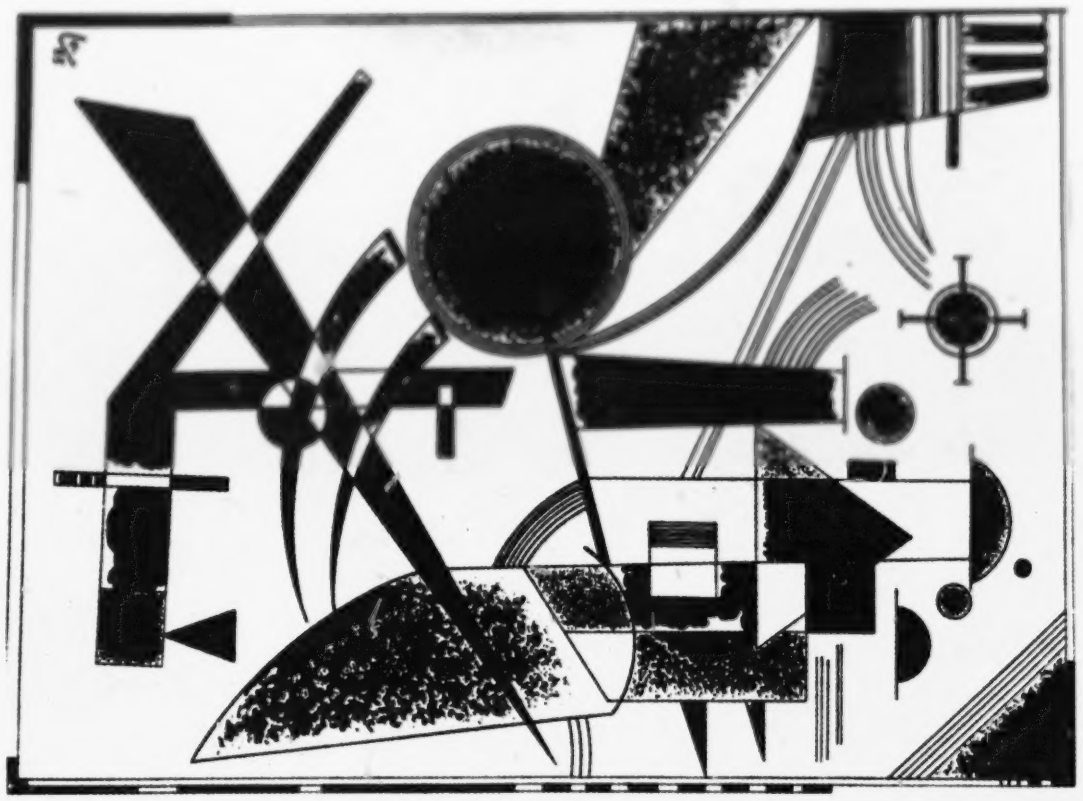
By- DeCarlo, Charles R.
Systems Design and Nature of Work. (Seminar on Manpower Policy and Program, Washington, D.C., November 17, 1966)
Manpower Administration (DOL), Washington, D.C.
Pub Date 67
Note- 46p.
EDRS Price MF-$0.25 HC-$2.40
Descriptors- Change Agents, Industrial Structure, *Information Systems, *Productivity, Seminars, *Systems Approach, Systems Concepts, *Technological Advancement, *Work Attitudes, *Work Environment
Identifiers- Manpower Administration, Seminar on Manpower Policy and Program

The application of technology to production has had the effect of continuously removing man to greater distances from the actual material, or work, being transformed in the environment. We are about to enter a new phase of history, sometimes called the second industrial revolution, in which work occupies a different role in life. This revolution is predicated upon the fact that the technology of the first industrial revolution can now be controlled at a distance through information systems which rest upon four fundamental technological concepts: (1) Transducers are capable of sensing and transforming experiences into electrical signals. (2) These signals can be communicated over very long distances. (3) The material that is communicated can be captured and stored in electrical memories, and (4) Logical decision-making machines can transform the recorded information. These four technologies enable man to design systems which can perform control operations both at direct work levels or in the amplification of the human intelligence in a white-collar environment. The design of systems for planning and controlling necessary work, for providing a sense of individual worth, and for making free leisure time a positive goal is among the major responsibilities of any leader in this kind of environment. (ET)

EDO 24771

OCT 2 5 1967

SEMINAR ON MANPOWER POLICY AND PROGRAM



Systems Design and Nature of Work

by CHARLES R. DeCARLO

VT004952

U.S. DEPARTMENT OF LABOR MANPOWER ADMINISTRATION

- This report is one in a series of proceedings of Seminars on Manpower Policy and Program sponsored by the Manpower Administration. It presents a condensed transcript of the seminar held in Washington, D.C., November 17, 1966.
- The purpose of the seminars is to provide a platform for guest speakers and for members of the Department of Labor and other agencies concerned with manpower problems to discuss issues arising from the development of an Active Manpower Policy.
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SEMINAR ON MANPOWER POLICY AND PROGRAM

Systems Design and Nature of Work

by CHARLES R. DeCARLO

U.S. DEPARTMENT OF LABOR
Willard Wirtz, Secretary

MANPOWER ADMINISTRATION
Stanley H. Ruttenberg, Manpower Administrator

OPENING REMARKS

Chairman—Dr. Howard Rosen
Assistant Director for Manpower Research
Office of Manpower Policy, Evaluation, and Research

DR. ROSEN: This seminar is the 26th in a series of Seminars on Manpower Policy and Program, which began in April 1964.

These seminars are sponsored by the Manpower Administration of the Department of Labor to provide an opportunity for invited guests and members of the Department to discuss the issues raised in the *Manpower Report of the President,* and also to discuss the issues in the evolvement and development of an active manpower policy. As you know, the reports of the seminars are published by the Department in separate pamphlets.

The subject of today's seminar is "Systems Design and the Nature of Work." Today's speaker is Dr. Charles R. DeCarlo, Director of Automation Research for the International Business Machines Corporation (IBM). If Dr. DeCarlo is as good a lecturer as he is a luncheon conversationalist, I think we are in for an extremely interesting afternoon. Dr. DeCarlo, who has been with the IBM Corporation for some 15 years, has had a wide variety of experiences within that framework, ranging from applied science representative to Director of Systems Research and Development. Now, he is in charge of automation and related problems. He has a Ph. D. in mathematics from the University of Pittsburgh.

The moderator is Mr. John K. Harris, Head, Special Studies, Government Systems Department, System Development Corporation, Falls Church, Va. He has had extensive experience both in and out of the government. He was a former employee of the Department of Labor, where he was the Project Director of the fa-

mous experiment, Counselor-Advisor University Summer Education (CAUSE). Mr. Harris has also served as Director of the Urban Projects Division of VISTA. He was the Assistant Program Development Director for the Youth Opportunities Board of Greater Los Angeles, and is now with the System Development Corporation of Virginia and California.

Let's now turn to Dr. DeCarlo whom I am extremely pleased to present to this audience. I am particularly happy because all my life I have always wanted to introduce to an audience a man who wrote a dissertation on "Hyperspacial Representation of Tangential Differential Elements."

Dr. DeCarlo.

Systems Design and the Nature of Work

An address by Dr. Charles R. DeCarlo

DR. DECARLO: The concept and the act of work constitute such important parts of man's life that any single view of the nature of work must fail to miss its essence, for it touches every aspect of man. This importance led Freud to couple the ability to work and love effectively as the cornerstones of the happy life. In the modern world the absence of work, manifested as the problem of leisure, becomes, to some, a frightening situation. In what follows, I will consider some aspects of the nature of work, after which I will consider the effect of systems design, or the environment of technique, upon both the quality of work and the attitudes it evokes.

Let me begin by reminding you that the definition of work in physics is the application of force through distance. This implies that the fundamental quality of work is related to the expenditure of physical energy moving, or causing motion, in space against some resistance. This is intimately related to our intuitive grasp of work through our motor-sensory equipment. Work is the first natural extension of man's senses, and in accomplishing his work he becomes in Benjamin Franklin's phrase, "The toolmaking animal." Technology to date has consisted largely of developing simple and complex machinery to amplify, extend, or refine the external musculature and control system of the human being. Most of the fundamental mechanisms required to extend the senses have their origins in anonymous antiquity; the wheel, the axle, the sail, the lever, etc. It was Archimedes who developed the water screw and the block and tackle—devices which combined other simple machines for the execution of work. Throughout history, as simple

machines were refined and as control over material became more powerful and flexible, they were assembled to make increasingly more complicated machines. The machines of the Middle Ages testify to the ingenuity of inventors to combine simple mechanisms into beautiful forms. They also represent part of a historical continuum of technology.

The application of technology had the effect of continuously removing man to greater distances from the actual material, or work, being transformed in the environment. The development of prime movers such as the steam engine and electric motor completed the process, enabling man to become essentially the controller of both the force and the action through space that constitute the physical definition of work.

But there is another aspect to the physical nature of work which has to do with the amount of work to be done in the world and depends upon the materialistic viewpoint of the cosmos. This is expressed best by considering the ideas of thermodynamics which are based upon the law of the conservation of energy and the law of entropy. These state that there is a certain amount of energy available in the universe and, secondly, that over the long span of time the amount of available energy that can perform useful work is diminishing. This diminuation is referred to as increasing entropy. The consequence of this is that the world will ultimately run down to a still, cold blackness. In a recent issue of *Daedelus* an article appeared entitled, "Uses and Abuses of Thermodynamics in Religion." [1] In it the author traces the ideas of the first two laws of thermodynamics as they relate to the fundamental ideas of religion and God. If the idea that "God is dead" has any one focus of cause, it is probably in the materialistic and scientific definition of the world—a definition which points to a cosmos resting upon the laws of thermodynamics. Not only can the world be defined in terms of mechanism and work, but the assumption of the finiteness of work and of energy suggests a finite and definable man, as well as his ideas of God. At the root of the conflict of religion and science is the subtle importance of man's work in the world and its meaning in either a finite and purposeless or infinite and teleological universe.

[1] Erwin N. Hieberg, "Uses and Abuses of Thermodynamics in Religion," *Daedelus*, Fall 1966, pp. 1046-1080.

Another aspect about the physical nature of work, which affects our view of reality in more practical ways, also flows from these laws. If the amount of energy is bounded in the universe, and if the amount of work to be done in satisfying man's needs is finite, then the application of technique, with its increase in productivity, will produce goods in sufficient volume to satisfy all of man's needs. Men have always resisted changing their ways to increase their productivity through new techniques. This is probably because increases in productivity bring forth natural questions such as those of goods distribution and authority legitimacy roles within and among institutions, etc. Both workers affected and the managers of the process have a conservative tendency not to change. In its worst form this is Ludditism. "Worriers" about leisure in an age of abundance are, in a sense, intellectual Luddites in that they conceive of man's ultimate purpose as related to the creation of consumable things through work. Commonsense tells us that there is still much work to be done in the world, particularly if we consider both the Eastern and Western worlds. However, even if all necessary work were completely accomplished by machines, this would present opportunity for a new kind of aesthetic life.

Work as a Necessary Evil

Before technology, before life became other than a mere struggle for survival, man had to explain the cruel world to himself in some satisfactory way. Thus in most myth systems there is the notion of transgression against the gods and the Fall of man. In Genesis the exortation to "Earn thy bread by the sweat of your brow . . ." explains man's travail. Indeed the very word "travail" has not only the notion of work, but of suffering. Probably ever since some man began to think about his relationship to the world, he had to make work a necessary evil, an infliction placed upon him because of a fall from grace.

The extension and coloration of this attitude throughout Christian theologies have had a profound effect upon shaping the technological world we live in. In both Weber's and Tawney's studies of the relationship of Protestantism and the spirit of capitalism is the fundamental idea that man was doomed to work, and that

work is one of the necessary avenues back to grace. It is clear that reducing the amount of physical work to be done in the world, with the consequent generation of "free" time, will add new dimensions to problems of religion.

Flowing from the physical and theological nature of work, we come to a consideration of another of its natures—its psychological import. A man's work has been considered a principal part of his purpose for being. Throughout history the content of his work in large measure determined, or was correlated with, his social status. He was rewarded on the basis of his competent participation in the acts of work. And through his work he could measure his own worth and his participation in the society. As toolmaking became more elegant and as the extension of the senses were aided by technique, the emergence of the craftsman helped mold the society and its values. In this context there were not only the reward or punishment for work and its measurement, but also the cultural and aesthetic concept that work was a completed act in which individual craft was displayed in transforming material into a usable item. Guilds of the Middle Ages were the high point of this association of work and its craft in determining the status of the individual within the group. Because work was a measure of individual worth, perceived both publicly and privately, there was a direct relationship between the quality of a man's work and his role in the society. The superior craftsman developed his work as an art, something which embraced not only craft but the love of refinement, elegance, and balance.

However, there developed, as technologies became more powerful, generalized extensions of the senses which could be combined mechanically to eliminate the need for craft production. The craftsman per se disappeared, though there remained the vestigial ornaments of the craft idea in some of the modern trade unions. But modern technology has not only removed the nature of craft which enabled an individual to view his work through the completed act, but has made more time available to individual workers who, through this time, can perceive their psychological relationship to the world around them.

Below the level of craftwork, most of the world's work has been done in its past through the various types of slavery. Probably not

much psychological awareness would be perceived by individuals who had little time to think about anything but their stomachs and a place to sleep. It is safe to say that the pervasive existence of psychological problems of work are a relatively modern phenomenon. This is made evident by a picture which not long ago appeared in *Life* magazine's series on China. It was a picture taken some 50 years ago of a 14-year-old boy crawling up a mine shaft with a bucket of coal behind him in a basket. The basket was pulled by reins which were attached to his head. I doubt that this boy, with the short life he probably lived, had the time to be aware of the psychological implications of his chosen work.

One final aspect which we will further touch on later concerning the psychological implications of work is the complementary phenomenon that when work is defined through technology, it is defined in terms of functions that men can perform rather than by the totality that is man. In conceptualizing the work process in mechanical terms, we are led to organize the flow of process, of analyzing function and form into smaller and smaller units. These functions are analogous to man's most elementary components of seeing, hearing, and motor manipulation. Nicholas Berdyaev wrote of this: "Technical civilization demands that man shall fulfill one or another of his functions, but it does not want to reckon with man himself . . . it knows only his functions."[2]

The physical, theological, and psychological qualities in the nature of work were welded and woven together in the concept of economic man as there developed in the late 17th century the view of man as part of a production system, a system that permitted the description of man in terms of his work and the exchange of products and service. Since man was now living through technology above the survival level, there was sufficient energy to do more work and create more products, thus presenting the problems of goods distribution. Men were defined as hands, hands that were attached to technological devices; work was defined in such terms as "a fair day's wage for a full day's work," but often work was geared to machines and not to the sun.

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[2] Nicholas Berdyaev, *The Fate of Man in the Modern World* (Ann Arbor: University of Michigan Press, 1935), p. 33.

The integration of economic man into productive and distributive processes through work proceeded in concert with the development of the idea of progress in the 19th century. However, not only has man as a "hand" disappeared as a meaningful entity in the work environment, but the idea of the working day also has changed. The rhythms by which men work in the modern world are considerably different from those of the farmer or slave who worked from sunup to sundown. People who work indoors rarely see the sun or are sensitive to its rhythms. The psychological and theological problems that flow from this are part of the anxiety that is produced as economic man sees himself portrayed as part of a world of work, paper, and machines.

Implicit in the idea of economic man is the fact that he shall receive reward for his work commensurate with his contribution and competency. This is most easily measured where a man works only with his hands. However, as technology is interposed between man and work and as work is organized so that many people participate in the performance of one completed act, the reward for work on an individual basis becomes difficult indeed. This is seen in those industries in which group incentive activities are used as a measure of work.

Yet in preparing young people for the world of work, we harken back to the ethics of work which are essentially Jobian in their theological outlook. The work ethos is predicated upon working hard and being rewarded for hard work. But the idea of hard work is difficult to define in a world in which technology removes man from the fundamental transformations of nature. As technology has been applied, there are four aspects of the nature of work—namely, its physical, theological, psychological, and economic qualities.

The Absence of Work

The final aspect of the nature of work is, in a sense, its complement—namely, the absence of work. For the first time in history the problem of the absence of work, the problem of leisure, becomes a serious one in society. The uses of time divorced from the necessity of work become a problem for men who now find "time

on their hands." The steel industry's settlement which includes 13-week vacations and the recent tugboat settlement allowing workers to work half time are examples of a trend. Either men find ways to work overtime, or they become concerned with what to do with the enforced "free" time. At worst, men will seek diversions "to kill time," the very prize for which they fought.

If the nature of work has changed and we are about to enter a new phase of history in which it occupies a different role in life, what were the principal causes of change? I think we all agree that at least in the Western world, and more particularly in the United States, the nature of work has greatly changed, if only measured by the fact that in 1945 over half of our labor force were in the service trades, while in 1955 over half of the labor force were white-collar workers. These statistics are matched by the fact that the farm labor forces dropped from 60 percent in 1880 to less than 6 percent of the labor force in 1960, with almost 1.5 million people leaving the farms in the last decade. These statistics suggest that work has indeed changed and that it has probably changed rapidly enough to have an effect upon our basic value systems.

Briefly I would suggest that there are four major themes that have moved together to change the environment. The first of these was the development during and after the Renaissance of a different world view. This view enabled the rapid expansion of technology, the dissemination of information and intelligence, and the rapidly increasing mobility of people in the societies. It is enough to recall the idea of the medieval Great Chain of Being in which each man held his place and in which the entire universe was linked together in one spiritual chain leading from the lowest to the highest, with man in the center. This view of life and the universe so affected practical living that the societies were, as Elton Mayon described them, "established societies" in which each man knew his work and his place. In the enthusiasm and the energy of the Renaissance world, this idea was eroded by an almost cataclysmic rush of attempts to measure, describe, and predict the course of the world on the basis of new methods of knowing and viewing.

The second idea is the creation of durational time as the principal time by which man lives and measures as opposed to natural time representative of the sun and lunar cycles or the cycles of the

seasons. It was Galileo who made the first experiments in which accurate durational time was used for the measuring of phenomenon. As a result of these experiments he was able to sound the deathbell of Aristotelian kinetics. But the creation of time went beyond its role in science. Lewis Mumford has observed that monasteries created the hours of the day as measurable quantities to organize both their work and prayers. From this flowed the regularity of work and its measurement in terms of time. Most people now live by durational time rather than natural time. We have clocks all around us which are increasingly refined and defined in terms of sensitive physical measurement. The common electric clock is the ultimate widespread application of durational time for controlling and determining our viewpoint of the world.

The third cause was the rapid development of the scientific method which enabled the concept of mechanism to spread in a wild fashion. Following Newton and Descartes, the view of the world as a vast machine subject to immutable mathematical laws, capable of being known and predicted, encouraged development in the application of scientific viewpoint to every sphere of human activity, human activity which at the time was mostly concerned with the problems of work in the transformation of the environment. Since the universe was a great machine, all parts of it could be manifested as machinery. Thus the explosive inventions and application of technology.

The final theme is the idea of progress which developed at the beginning of the 17th century based upon both the Protestant theology and the emergent notion of the dynamo or the machine as the tool through which man could control the environment and move constantly forward. These themes wove together in a powerful dynamic which enabled the application of the scientific or technological viewpoint to practically every activity that man had undertaken or could conceivably undertake. The whole history of technology saw a rapid acceleration after the Renaissance when machine after machine was developed which did work and which, by the act of doing work, removed man from direct involvement through his senses with the environment. So profound was this change that Henry James characterized the difference between

these ages in the phrase "the virgin and the dynamo." In the Middle Ages the dynamic which moved the society was a transcendent spirituality of the vision of heaven as manifested in the great cathedrals, while that of the 19th and 20th centuries was the dynamic of the machine in which the environment was operated and molded not in the transcendence sphere but in the sphere of the physically malleable.

Not only was the physical nature of work being extended to the application of scientific method and technology, but at the same time the bases were laid for the behavioral or social sciences in which the viewpoints of science were applied to the nature of man, both individually and collectively. This was paralleled by the development of machines and techniques for the handling of the information which described the world of work that technology was creating. Finally, the physical concept of work became more the responsibility of machines, and the organizing, the understanding, the planning, and the control of work became the responsibility of people—the clerks and the white-collar workers. And it seems apparent that over the next decade, this trend will continue.

There are some that view this course in the nature of work as a loss. Among these are those that have a romantic notion concerning the dignity of work. It seems to me that the only people who worry about the dignity of work are those who are sufficiently removed, largely as a result of technology, to have the time to ponder this dignity. I doubt that the boy I mentioned in the *Life* photograph would have had much to say about the dignity of work, if indeed he could even understand the concept.

Another complaint against the changing nature of work, again a romantic notion, is that through the technological process man has placed himself out of nature; he no longer has the direct sensory or kinesthetic experience of work. In this consideration, there is probably a more valid and arguable case. However, we have not yet begun to explore the possibilities of establishing a new aesthetic of work and life in a world in which the physical is less important than the cerebral or aesthetic. The opportunity for life as a new art form can be built upon the time made by technology.

Technology Guarantees a Longer Life

I consider several things about the changing nature of work to be incontestable and largely positive in establishing both new levels of dignity and potential for the human being. First, as technology has been introduced there has been less physical energy required, and thereby less fatigue and deterioration of the human being. In other words, technology in its widest sense has guaranteed a more abundant and longer life. The figures on infant mortality, longevity, etc. prove conclusively that more life is being lived today with less effort and with more marginal energy available for other than work than at any other time in history.

Secondly, as technology is applied, its application leads to more communication in and around the machines people work with. I realize that this is probably not always true, but the fact that man is removed through technology from the immediate transformation of the physical environment places him closer to other workers. It also places him in a different rhythm in which there is more opportunity to see and communicate with other people. The farmer who led, in Hobbes' phrase, "a nasty, short, and brutish life" was probably capable of a minimal amount of grunting and human communication. I suspect that even in the "dark satanic mills" of Blake, people were better off than on the barbaric farms of the midlands. Certainly as white-collar work has increased, there is not only the opportunity but the requirement for more communication. This leads to deeper interpersonal relationships. Not only must people communicate, but they must now work in concert with systems and with machinery in such a way that group objectives or goals are realized. In the training of young people for the world of work today, the development of their personality and their interpersonal skills are of much more vital importance than the development of craftlike or technical skills. This is even manifest in the highest levels of organizations where top executives complain of the specialized technical training given to executives. Such training makes difficult the development of leadership and vision, which are predicated upon an understanding of the human nature and the human condition, and not upon technique.

The fact that work has been upgraded through technology and now contains more science- and technology-based activities requires

that people who work among machines must deal with higher levels of abstraction and conceptual thinking. Even work in the blue-collar environment requires a minimum liberal education—an education which, if viewed historically, would make each man today the equivalent of a trained craftsman or citizen of the world in the Middle Ages.

The final and perhaps most important change in work introduced by technology is the fact that it is the technological act which has created time. This is the same durational time in which technology itself is couched. This time defines the self as it lives in the technological environment. Only through living in a technological environment can we have the time to worry about the problems that the technological environment produces. Philosophers, poets, and aristocrats were rather rare in the past. Their particular and common rare feature was that they had the time to ponder and to concern themselves with the purpose and the nature of the life they were living. The earliest educational dictum, and perhaps the most enduring and meaningful, is that of the Delphic oracle, "Know Thy Place." Furthermore, this place was generally defined in terms of the kinds of work, physical work, that a man had to endure. Technology has lifted the concept and nature of work from the back and the hands to the brain and the spirit. That this induces intellectual and spiritual problems is obvious; that it also creates time in which these problems can be assessed and converted into human potential is the other side of the romantic coin, the side which is too often ignored because of our dark view of the ethic of work.

If we can now agree that the nature of work has changed both in its impact on our physical, psychological, economic, and theological attitudes, we are now in a position to ask what is the future of work. This is why I have coupled the nature of work with the problem of systems design. One definition of system is a set of things or objects associated so as to form a complex unity. Not only is physical work through technology organized to become systematic but, more importantly, the control of work is being organized through the application of abstract or white-collar systems. Another way of saying this is that modern man is increasingly living in an environment of technique. I use this phrase because the

word "environment" means either to be surrounded by, or that in which we find ourselves. The word "technique" connotes the manner of execution or performance in relation to practical details as distinguished from the general effects or expression of sentiment that accompanies an act. In other words, technique is the mechanical and formal part of an act as distinguished from the purpose or the aesthetic. The phrase "environment of technique" sums up the dilemma of ends versus means. One of the dangers of living in the environment of technique is that the human existence becomes dominated by the technique to the exclusion of form or purpose. Indeed this is the basis of such books as Jacques Ellul's *The Technological Society,* and for much of the pessimistic thinking concerning technology.

But admitting that the environment of technique is one in which man is surrounded by means suggests that, for the first time, we have the opportunity in our abundance or means to guide the human experience to problems of purpose. The practical manifestation of this is seen in the operation of large organizations, particularly as they use the technologies of control and communication. Since the development of the electronic computer and other methods of creating, transmitting, and displaying information, we find ourselves moving into a world in which the information which is descriptive of technique enables the building of models, abstract and intellectual, which describe the environment. This is a latter-day extension and application of the scientific or mechanistic viewpoint that dominated the world after Descartes and Newton.

This revolution, commonly called the information explosion or the second industrial revolution, is predicated upon the fact that the technology of the first industrial revolution can now be controlled at a distance through the use of scientific methodology. Let me sketch briefly the nature of that technology, and then interpret some of the systems design problems that are implicit in organizing the new world of work under its constraints.

The world of information technology and the design of information systems rest upon four fundamental technological concepts. The first of these is that we now have ways of sensing and transforming experiences into electrical signals. This is done through

devices called transducers. Simple examples of transducers are the telephone which converts the voice into electrical signals, the television camera, the teletypewriter, etc. Our sense of sight, sound, and touch are immediately amenable to such transduction. We can now store, through magnetic tape, information which is codified and entered through keyboards by fingers, photographed by cameras, or listened to by devices either audio, temperature, or pressure sensitive. The fact that we can specifically create this information in discrete pulse form reminds us of the epistomology of Hobbes who said, "Knowing comes through the impingement of the smallest atoms or motion." And now our machine "knows" in little pulses. Thus, in the machine world, we have essentially a new kind of mechanical epistomology. We can know the world through transducers which can convert one sensory experience into a common base phenomenon of electricity. The practical implications of this are everywhere.

The second technological concept is the ability to communicate such information or experiences over long distances. This is the art and science of communication. We are familiar with the telephone, television, etc. An important point to bear in mind is that in the 20th century, we now have a scientific discipline which tells us how to design communication systems so that we can guarantee the transmission and reception of a signal which has that level of fidelity to the original, subject to cost considerations. The effect of this is to create in man a different sense of space, for now one can communicate with one or many over long distances. In both cases, however, the reception of communication from point to point implies on the part of the receiver some shared meaning.

The third aspect of technology is the fact that we can capture the material that is being communicated and store it in electrical memories. Because we can store information, its codification and retrieval have suddenly exploded into major crises. As in all recorded information, we must know what the information means and where it is located in order that we can retrieve it. We now have memory devices that can store billions of pieces of information representative of experience and can retrieve them under appropriate codification schemes in millionths of seconds.

Changed Concept of Time

This leads to another imperceptible change in our view of reality, namely that through the development of memory we have changed our concept of time. We have only to consider the experience of watching a televised football game in which half of the screen shows what is currently happening while the other half shows the play that might have happened 3 or 5 seconds ago. Further, this second screen could be subdivided and show an interview that might have been recorded with the halfback 6 months ago. Such illusions that memory permits through technology are now an accepted part of our environment.

The final and perhaps most subtle application of technology is the development of logical engines or machines which can transform recorded information. Since the 19th century, the powerful deductive inferential systems resting upon Aristotelian logic have become increasingly drawn into technological representation. Using electrical relays first, then tubes, then transistors, it was possible to build machines which could exercise logical decisions and choices upon information according to some plan which is stored in the system. Furthermore, the language for this plan, the control language, can refer to itself. This means that the logic within the machine can revise its own behavior. Let me be perfectly clear that its ability to revise its behavior depends upon those logical choices which are implicit in its deductive system at the outset.

In sum, these four technologies of sensing, communication, memory, and logic enable us to build systems which can perform control operations both at direct work levels or in the amplification of the human intelligence in a white-collar environment.

The relationship of systems design to the nature of work begins to take a new dimension. Consider the work carried on in one of the large corporations producing goods in America. At the physical level, the product very likely involves a high component of engineering design, control of material, prediction of the physical environment, etc. This is expressible in abstract, mathematical, or logical models. But within the organization, mechanistic views can also be applied to the relationship of functions such as inventory to production or production to engineering. Perhaps this is best sug-

gested by the phrase attributed to Jay Forrester of MIT, "Industrial Dynamics." This leads to the next level of scientific, mechanistic application which is planning the environment to achieve certain measures. These measures may be cost, profit, share of market. Such measures are stated in 5- or 10-year planning cycles where resources are allocated, within the concept of an ordered and rationalized environment, to produce the desired results. At the highest level is the relationship of the organization to its external environment and to its markets, government policies, etc. New methods of modelmaking of larger organizational units are beginning to emerge in this domain.

Each of these levels of control or systems design is operative in white-collar environments and concerns the qualities of management. Because the "work" of the organization is viewed in scientific terms, it is only natural that all activity that can be included within that format be described in terms of function and process. This then leads to the concept of organization charts, functionalism of work, the measurement of work in terms of mechanical entities, and so forth.

The management of such human enterprises which are a symbiosis of machines, information, and people becomes a principal kind of leadership within the society. Management in this environment is considerably different from the kind of leadership that has been historically used in the driving of slaves, the leadership of military ventures, or even the management of machines and directly related human beings. I might also point out that those agencies which do not deal exclusively with the physical, such as government, education, etc. are increasingly beginning to adopt similar viewpoints in the management of their own white-collar organizations. The design of systems of control which permit inspirational leadership and a sense of participation on the part of those led is one of the major problem areas in the modern industrial and government scene.

With respect to the worker himself who now lives within the white-collar circle, he experiences the difficulty of knowing the value of his work, of measuring it, of finding a replacement for the idea of the completed act, or even of relating it to the work ethos that he learned in his early years. Too often in the white-collar

environment, working hard has been replaced by working long. Simply spending more hours shuffling paper seems to convince many people that they are working hard. Yet it is quite difficult to define what working "well" means in a complicated system in which the individual plays the part of participant—a part which cannot be perceived in terms of the whole.

In addition to this the individual must work in an environment of others such as himself. This leads to problems of interpersonal conflict, of adjustment of individuals to group values, and the whole host of civilized existential anxieties. When this is considered against a background of rising educational levels and expectancies, it highlights the importance of appropriate systems design in its broadest sense. It appears that in a service, white-collar, abstract environment, service as a way of life must be included as a vital part of the education and training establishment.

One of the most important functions in the future of the large organization will be the development of personnel practices and policies which assure not only the legitimacy of responsibility and authority, but equity for its individual membership. The historical interface between the work process and management generally took place between the intangible management boundary and the physical reality of processes and services. As we have indicated, the nature of work is changing so that more people are involved on the intangible side of the boundary. However, the same problems of psychological equity, working conditions, economic well-being, and opportunity continue to exist, though in a more subtle way. The rationalization of processes and the changing nature of work have moved this boundary lower in the pyramid while at the same time raising the complexity of the issue. Probable developments in information processing and communication technology in the coming decades present management with the opportunity of restructuring organizational practices. With the aid of such technology it may be possible to develop organizational forms more nearly suited to human and system needs. With a more sophisticated analysis, articulation of policy, and establishment of broader goals, it may be possible to develop an organic form in which "purpose-centered units" are coordinated through a network representative of the organizational totality.

The design of systems for planning and controlling necessary work, for providing a sense of individual worth, and for making free or leisure time a positive goal is among the major responsibilities of any leader. To move from a world of necessary toil to one of knowing ourselves in time should be the goal of managers and educators alike.

DISCUSSION PERIOD

Moderator—John K. Harris, Head, Special Studies Government Systems Department System Development Corporation

MR. HARRIS: Thank you, Dr. DeCarlo. I am going to take advantage of my position as moderator to ask the first question. You talked about work. You did not talk extensively about its antonym, rest, nor about something that is very human, recreation—in the sense of the re-creation of the self rather than the use of leisure time to rest or recover. Would you like to comment or build a relationship between work and recreation?

DR. DECARLO: In answer to that question, let me first stay within the context of work. At IBM, we tried to take a man who worked on one machine and broaden his job so that he worked on several, thus easing the cost of inefficiency measured in terms of physical output. The aim was to make him better in each one of the functions by providing him with an overall view. Work should be just part of a person's life, and hopefully, about one-half of what you do as work should overlap with what your real loves are. I don't think that everybody should love his work completely unless he is a genius, and then he has no choice. If you are working for a living, I think it's nice to have a balance where half of your work overlaps half of your pleasures, and each supports the other. I think we are in a position to start training so that work can be stimulating. I not only contend that we should support it, but I think that if we do not we are going to be in terrible trouble. The trouble is going to be kind of sneaky, namely, that the educational, cultural, and spiritual expectancies of our population are going to rise faster than any technological change.

I consider there to be three great innovations in our lives since the end of World War II. One, the GI bill, is someday going to be seen as a tremendous change in American experience because it took a whole group of people from our generation and raised their sights, exposed them to college, and created a new way for them to view themselves. I think that when we broaden interests, we improve society.

The next one was the Sputnik, which brought about overemphasized excellence in the needs of schools, education, science, and so on. That has had a profound effect.

And I think the next change will be rendered by the poverty program, which is basically one of education. That is going to change expectancies again. If you accept that argument, then you have the odd situation where work may become more and more automatic and educational expectancies higher and higher. Since people expect more from their work, we had better find a way to make at least part of the work experience dovetail with the total man and the total woman, so that they are neither completely in the work experience nor completely out of it. If something is worth teaching, it should not be taught at public expense. If it has some monetary merit and is connected with the product it processes, the teaching should almost be done by the agencies of society that create services. What should be taught are those things that are priceless.

FROM THE FLOOR: You talk about education but what we know about education today is not what you are talking about whatsoever. The poverty program is giving education a new dimension. It's making us realize how much education is a certificate rather than any particular knowledge. It's the entry that you have into the society. We don't give the Negro youth a job because he doesn't have a "certificate."

Education has its Roots in Training

DR. DECARLO: I think that education, by and large, has its roots in training. I believe that everybody ought to be automatically guaranteed a diploma, which I consider nothing more than a work certificate. But that's training. In a world where skills are less and

less important as unique and endurable items in life, you move up one level and learn a variety of transferabilities. We are at that point. In the next decade or two, we will be exhausting that point. Then we will have to move up to a level where we can take a person out of high school or college and put him down in any one of 15 white-collar departments and train him to do the work there. When we reach that state, we had better assess what we are educating for if we separate training and education, because we need an educated, not a trained, society.

FROM THE FLOOR: How do we get industry or some other part of society to take over training?

DR. DECARLO: Private industry should not be asked to do anything on the basis of charity or philanthropy. Under reasonable leadership there are all kinds of policies you can establish to throw a greater burden of training on industry. One is the gradual pervasion in the community of the idea of education as an investment. There should be some way to encourage corporations to take an investment philosophy about training their people. I am sure that man's natural avarice and entrepreneurial stress can be directed toward training people. After all, IBM's budget last year for educational training was about 80 or 85 million dollars, and we don't do that as a philanthropic operation. I know that IBM is in a very favored position technically, but I do believe that under creative leadership we can put much of the practical training where it belongs, which is in practice. The great benefit that society would get out of this is the change that would follow, because you could cover the training costs where they're used. You would not have the big human investment. If business had to pay for this training, it could be tied right in with business programs.

DR. ROSEN: If you shift the burden of training to industry, let's look at this from the point of view of the individual, that is, the work. IBM is interested in training only for its own activities. You are tying a worker to IBM. You are not necessarily producing a person who will have mobility for the rest of his life, and you do not give him the wider kind of training that a public educational system is supposed to provide. In other words, where does the worker get the maximum kind of return?

DR. DECARLO: First of all, the point I was really making about white-collar work is that I think there is a high degree of transferability. White-collar work is a kind of universe with a great deal of movement and freedom. Training, whether it's IBM, GE, or the NASA program, is training that is of value across the board.

The second point is that there ought to be absolute guarantees of mobility of the individuals from company to company. There is no question in my mind that it should be an investment in the individual and not in the company. Given those two things, I think training should go more and more into private industry.

I want a society in which there is a maximum amount of organic fragmentation. I'll put it negatively. I want a future society with the freedom to hide between the bignesses and the smallnesses. I want individual freedom. I think the way to achieve that is to make the work organization very efficient, to guarantee the ability to move around. I am the last human being to suggest that you can plan any activity involving humans for more than a 6-month period. What this brings me back to is the need for creative political leadership, not just political leadership with a public service, but political leadership in a great private bureaucracy. I am for chaos in the society, for seeming chaos, but under it, a structure in which I can dance around.

FROM THE FLOOR: I have three questions. What, in this education or training process that you envision, creates for the individual the sense of community, social purpose, public interest, the complex sense of belonging and participating in our society?

The second question is, who are the necessary few individuals who see the whole thing as a single part, or large parts of it as a single part, like Standard Oil and IBM? To whom do they account for the value judgments that they impose upon the society that you foresee?

The third question is really not a question. But aren't you really escaping from the real problem of where to go?

DR. DECARLO: I'll take them in reverse order. I'm not escaping from where we are going. If I am alive, I am going to be there. I am willing to live in any kind of a society personally.

Regarding your second question of how to get the business leaders or the leaders of any bureaucracy to have the right values so that they make sure that Standard Oil, IBM, GE, the Ford Foundation, and what not, do the right thing, I don't think you can do this. I think you rely in a society on producing the right kind of people so that they scramble and fight for the various powers, and by the time they get there, are reasonably intelligent beings. But, we need a very clear reassessment of ideas that come out of physical engineering and economies of scale when they are translated into groups that exercise them. I would prefer to get at the question of what kinds of leaders we are going to have in the future. I would prefer to guarantee any unit in the society and rely on any kind of person, from the most reactionary to the most liberal, the most beautifully organized mind to the most chaotic. Once you start to plan "This is the kind of leader we have," you have taken a great step back in history. I am willing to play Russian roulette with my kids' future, but I would like to see the game stacked so that no one gets too big.

With respect to the first question, how do you guarantee the sense of community, that's a completely personal belief. I think the idea of teaching community values by, "Look, Jane, look; here is a community," is worthless. Maybe I am egocentric. To me, the community only exists to the extent that I think I am important. If I think I am important, then I observe what is going on. Then, secondarily, I say this community is something which I must support. So I would opt for highly individualistic training. If kids really care about themselves, it doesn't take very much of a step to care about others. Once you care about others because you care about yourself, then it will follow that the community exists.

FROM THE FLOOR: I agree with the last point. I think public education or public responsibility for a minimal level of education or training can be modified, but once the community is responsible for it, and has an interest in it, a sense of community, a sense of belonging ensues.

DR. DECARLO: I would hate to see one institution, namely, public education, saddled with the responsibility for all of our community cohesiveness. I am not a churchgoing man, but I think the churches have a lot to do with it, as do families, business corpora-

tions, government agencies, everything you belong to. We have the opportunity and, I believe, the demand, because of the nature of the work that these kids are going into, to create a new kind of child, a child that is much more autonomous. In a sense this is ironic because what gives us this ability is technique and organization, the very thing that the college kids are complaining about; organization, the thing that gives them the chance to complain. I would like to see these kids take over as individuals and ut in their values. I don't want to sound like I am all against the kids, because I happen to think they are right. I am willing to take my chances in our society because it's an educated society of today.

MR. HARRIS: I would like to make two observations. One is a recent statement that what happens in the community is a much richer source of information, which is one of the reasons schools seem so commonplace and dull today.

The other one is related to your point that you would like to see these people struggle through on the grounds that when they got to the top they would be reasonably intelligent. An aphorism to adorn that comment is that "the school of hard knocks publishes its diplomas on scar tissue."

FROM THE FLOOR: My comment is more in line with the last gentleman's. It seems to me that if we are going to reject our society's idea of what work is and what, therefore, education should be, we are going to have to reinterpret the mainspring of our society which seems to be mainly prosthetic. How would you reinterpret this, in the light of your system, so that a society could actually mobilize and redirect itself in action along the lines that you suggest?

Need for Revision

DR. DECARLO: I am not a theologian, although I have a kind of passing interest in theology. The so-called Protestant ethic contends that work is a necessity, work with technique is capitalism, and, therefore, capitalism has its roots in the depravity of man. I am not so willing to throw away the so-called Protestant ethic. I think it needs revision. I object to the people who say that on January 1, 1967, we have to have a complete revision of the ethos of work. I

do think we have to find ways of making work appear at once unimportant in the sense of what it takes to participate in society, and more important in the sense that you, as an individual, are living in a very complicated society in which work has to be done because you must work and get along with others. I think you can transmute the precedent to account for this, but I don't think you have to throw the baby out with the wash. It's too easy to say that everybody works because they feel guilty if they don't work. I reject that. I think people are really much better than that.

FROM THE FLOOR: What would your reinterpretation be?

DR. DECARLO: All the problems we are talking about are very important. What do you do with children? I have a view of the child as quite independent in things such as Project Headstart, that we can begin training in very basic skills in infancy. You keep the relation going in very early years and you have a person who by the time he is 21 is so much more open to learning than we are now. So I say, number one, the child at the beginning is like a free-floating system. Second, I think we can teach children to read, write, and talk much before what we now call the preschool area. We can do it without making it look horrible. That's the point. The third thing, and this ties back into my notion of putting training close to the source of practical use, is that you can't do this by machines. Machines will be everywhere in the environment, but I look forward to a time when we have teacher-pupil ratios which start out maybe at four or five teachers per infant or young child, and building up to a point where, by the time they are in high school, there are 30 to 1. After that you have none because people will teach themselves. I would invest all of my educational resources in the child instead of the graduate school.

MR. HARRIS: Your comments suggest a book, *Stability and Change in Human Characteristics* by Ben Bloom.

I would like to add a comment of my own. In programed instruction we are now seeing company after company drop a million dollars into the growing market and then abandon it in humiliated defeat.

DR. DECARLO: I'm glad you used the words, dropping it. I don't think there is very much human knowledge that can be put into

programed instruction. I see programed instruction as a rather limited use of educational technology. People jump on the technological bandwagon and think it will solve every problem in the world. It's just not that way. Electronic companies, it seems to me, try to get into education primarily because we give them information. We are in the educational business. Garbagemen who carry away newspapers deal in information, too.

To be serious though, there is a tremendous untapped potential which could be used creatively in the educational process in the rather rapidly developing communication system in this country. In that I include the advertising media, television, paperback books, the technologies that IBM, RCA, and GE are handling, and material and visual displays. What I am talking about is not programed instruction, but taking and creating environments around the child through the proper selection of creative material. You can so flood this child; you can flood him with information. In one of my kid's sixth-grade social studies tests, one of the first questions was: Name the Three Authors of this Book. Now, why should she know them? You have to throw out an awful lot of trash and bring in the creative talent in our society that is now selling deodorants, literally. I hate to see so much of our creative talent there instead of writing movies, and writing them from different points of view, just as you write books from different points of view. That's it, not programed instruction.

FROM THE FLOOR: It seems to me that we are in a very difficult bind when it comes to paying for the kinds of activities you described. On the one hand, we are still very much the victim of the kind of thinking which feels that the budget, by and large, should be balanced. On the other hand, private business which has benefited from all kinds of special treatment and tax exemptions is now becoming aware that there are a lot of things it ought to be involved in and, if possible, further credits or incentives are offered so that they might be willing to use some portion of the 20-percent annual growth to add to the imput of the educational system. It seems to me that the one party that can afford to devote some portion of this growing wealth to this problem does not have to handle it and the Government gets the dirty part of the job and it doesn't have the resources. Where is the money going to come from?

DR. DECARLO: I am not sure that I am competent to answer that, but I'll give my opinion. First of all, I have to make the assumption that the notion of private property is somehow mystically embedded in the society. Given that, it seems to me that private enterprise exists within this society and it is the servant of society. But I think it should operate by rules and it should allocate its energies according to outside pressures. Therefore, you should not look to profit or nonprofit corporations to decide what is best for society, and do it. I would much rather look to the government, Federal and State. I think the local government is pretty defunct. But it seems to me that it's up to governmental leadership, reflecting the total society's needs, to institute policies which will make private citizens and private organizations do what is socially best.

I think that in a lot of our thinking we make the mistake of believing that just because someone is powerful, he should act responsibly. My view is that society should guarantee order so that powerful people do act responsibly. Don't ask people to do things as an act of charity. Some people are very greedy and are motivated from a lot of psychiatric or psychological reasons. That should be encouraged and used, but don't ask them to become philosopher kings.

FROM THE FLOOR: That isn't what I implied, sir. I didn't imply that corporate property should be given away. I think you avoided the point. It isn't so much a question of asking private corporations to act responsibly. You told us what you think ought to be done, what education ought to be like. I simply asked you, in the context of the present assumption of the role of government and the role of corporations, where is the money going to come from if the government cannot act and the corporations have to be prodded and plans have to be made?

DR. DECARLO: I think the money will come from where it has always come from when we fought wars. If we decide we want to do this, and want to do it enough, the money will come.

FROM THE FLOOR: I think the sense of urgency will come from the whole society and not the government alone.

DR. DECARLO: Don't you think it will come? How many more Watts must we have before the whole population wakes up? I am not a pessimist about these things. I believe that in some crazy way it's dependent, by and large, on an educated society. We discern ourselves in relationship with others. The ad hoc people want to make this crystallize and happen tomorrow. I am for patience. I say within two generations. I think that society will do just what you said, create that sense of urgency, and it will become not only national policy but patriotic to do your best in education, as you do your best in producing battleships.

FROM THE FLOOR: Would you comment on how computers are affecting underdeveloped countries in the state of development?

DR. DECARLO: I can only give you the most casual opinion on this, on two bases. First, there seems to be no other country, including Russia, that has achieved anywhere near our technological capability, both in design and production, in the development of software. So it's pretty hard to imagine underdeveloped countries doing this.

The second point is that I don't think they have any data basis on which to operate. They don't have a system for building beautiful automobiles. They don't have any roads. So I don't see computers offering much hope. I think it's a slow process.

MR. HARRIS: I would like to paraphrase a comment I heard during lunch, that in some foreign countries, especially in Asia, some assumptions that we have lived with have to be looked at very carefully. We assume that if you send a half dozen technicians over there, there will be a supporting human infrastructure of typists and mimeograph machine operators—people that you just take for granted are there—but they are not. An example was given of the person who spoke both Arabic and French in the Middle East but who could not write in either language and therefore could not really transmit signals any other way than verbally. There is an apocryphal story that the Arthur D. Little Company was asked by the Government of India to do a survey of India's informational needs. The question was: Is it feasible to centralize the information system for the Government?. According to the story, after 2 years the company representative said, "Do everything in prepara-

tion for the installation of a computer and then don't buy one, and you will have achieved 60 percent of the increased efficiency you otherwise would." But that requires those people called "systems analysts" to be present with the scrutiny of detail that Dr. DeCarlo talked about, and they just simply are not present.

FROM THE FLOOR: I would like to ask Dr. DeCarlo and Dr. Rosen what work has been done on using private enterprise to develop manpower in the sense that we were talking about earlier, to train people for things that would not necessarily directly benefit the company? In other words, what work has been done in the universities in the area of setting up systems that might be feasible?

Training of Youth by Industry

DR. DECARLO: I have a dilemma in answering this because there is a great training establishment in American industry which works on its own business base. Everything it does is paid for and justified. I had very discouraging results when I tried to get industry to train youth in New York City, for two reasons. One, and this is understandable, the businessman—I am not talking now of the chief executive or the director of personnel of a medium- to good-sized company—is confused as to just what his role should be in this. In other words, we go back to the cliché, "Let's not spend stockholders' money." So fundamentally, he is confused.

Secondly, he is not sure that this teaching enterprise will teach anything that is meaningful, because you are asking business in New York City to participate in remedial problems that are almost at elementary-school level. So after they participate, you don't have anything. This is unfortunate. I have really tried, and I will say with very little success, to involve business in training operations. Where it has been involved, it has almost always been the result of good will on the part of one or two people, not something that could be multiplied.

I think you need something that is outside public education, outside business, which would act as a staging area for practically all the children in the urban environment, and would provide job training and placement. You would actually create work for these people. I think it is ridiculous to pretend that you are going to

train people and then say, "I don't have a job for you." It's better not to train them. At least they can revolt then. I don't want to be facetious about it, but you can't imagine how difficult it is to get a businessman to turn himself around and say, "Why should I do this out of good will? It's not my mission." When you particularly ask him to tackle very tough and very ugly problems, he has a very natural fear of doing it. The public educational system, I am convinced, should not do this either. There should be a new agency. It should not be remedial. It should not be patchwork training, but a real agency.

DR. ROSEN: The only large-scale activity in which you involve private industry in some of these problems that are being discussed now is an on-the-job training program under the Manpower Development and Training Act. But this again is with the assurance that the companies involved would get paid for their expenses. What Dr. DeCarlo is talking about is that when you discuss the future you start to talk about the educational system, training a new kind of person, and thus you also have to get new personnel directors who understand that they have to hire a new kind of person. This cannot only be part of a system. The total system would have to extend from the employer to the personnel director to the educational system, practically to the parent. But you cannot do one thing and forget about the rest of the system. You have to have a whole new kind of philosophy that would pervade the entire educational and work system.

MR. HARRIS: A number of years ago the President of Crown Zellerbach gave a notable speech in which he said that when a corporation reaches a certain size, say 1,000 employees, it will achieve a kind of a demographic "critical mass" in the variety of skill levels it needs, and that it has a responsibility to reflect the demography of the community in the employee pool. The name of the speech was, "You Should Not Try to Steal All the Cream."

FROM THE FLOOR: Both of you have mentioned what has been done and what some of the problems are, but have business or universities set aside a grant and said, "Let's look at what system we might conceivably come up with if we thought about it in theory"? In other words, this is not just a question of whether

there are practical questions. This is a question of whether the framework has been set up yet. Are they doing anything about this?

FROM THE FLOOR: I would like to ask a question that goes back to what Dr. DeCarlo said. He visualizes a transition from the individual to the group among the white-collar workers and thus IBM should no longer talk about how to distribute profits to rob the stockholders. What they are really robbing is the social investment since profits are derived from there. Therefore, they go back to the social investment so that IBM profits, even when they invest in training that does not directly concern their own production. A kind of social gain accrues that will ultimately be reflected in the opportunity to utilize computers.

DR. DECARLO: Two points on that. I am a little concerned about corporate philanthropy; it can be overdone. If things are really important, and the society senses their importance, I would like to have a little more direction from the society rather than from philanthropy and charity. I don't want to see business corporations take too much power due to actions. I am more persuaded that they should be operating other broad policies, and that the system is set up so that they work for both the society's good and their own good. In certain cases where there is an immediate horizon of market, then it's not unreasonable under our present system for a corporation to undertake what might appear to be philanthropy. For example, IBM is pretty much in the lead in the computer business. Initially, maybe 10 years ago, there were very substantial discounts on equipment which permitted educational institutions, not just the top 100 but the ones which were having trouble getting money, to have computers. The result of that has not only been to make computer sales go up 10 years later, but it makes the computer known and accepted. That I can understand. But to ask beyond that, that a corporation participate in solving the juvenile delinquency problem, I don't feel very comfortable about that.

FROM THE FLOOR: You are very forward looking in your technology. Why aren't you forward looking in your social values and judgments? Philanthropy is not that IBM will do something for the United States; it's that the United States is philanthropic in allowing IBM to do what it's getting at now.

DR. DECARLO: I wear two hats. I wear my hat as a citizen first. There I am supposed to exercise all of my social awareness. To the extent that I can be reasonably humane in working for IBM, I will do so. But I don't see the integration of all the people in IBM having some required, identifiable sense of social purpose. I think that organizations should be required to do things because citizens want them to do it.

FROM THE FLOOR: In this frictional society, where does social program development begin, and how does the power structure arise which enforces it? I am not sure about this when you say that corporations should not be doing things on a philanthropic basis. Where are these decisions made and how is anybody in society supposed to know his, her, or its own role?

DR. DECARLO: First of all, the last thing I would describe society as is frictional. It might be fragmented with great tensions. No change of any real significance in social context is going to come without a great deal of agony. I am willing to participate. I do not say that because the masters of techniques seem to be so frictionless, don't look to them to solve these problems. We have a long way to go. We must solve the problem of race relations before solving the problem of education. It isn't going to be easy. I want to participate in that as an individual.

FROM THE FLOOR: In this transition period, don't you have to have these responsibilities as well as the wherewithal to do something? I think corporations and businesses have a greater ability to say they will reduce discriminatory hiring practices.

DR. DECARLO: Not only should they be encouraged to do this, but however it is done, in the Congress or the State legislatures, the pressure should be absolutely on. I don't think you should ask anyone to do anything in a materialistic, technological society beyond what he as an individual will do out of the goodness of his heart. Let the society put the pressure on and then the pressure is built up politically.

FROM THE FLOOR: When you say "society," it seems like, "Let George do it." I don't see where the things get started.

MR. HARRIS: I feel for Dr. DeCarlo because it's impossible for him to say openly that IBM corporate taxes should be raised. It seems to me, however, that that is the inference I am beginning to draw.

What do you Tell the Child?

FROM THE FLOOR: He has solved one problem. That leads to another. What can I tell John who is 17 and Mary who is probably 16 to solve all these matters for them? Shall they go on to school and study, get a refined and classical education, get away from training, and then be assured of a job and being taken care of in the economy? When I came along at the age of 15 or 17, there was no shortage of jobs. It was a mining and mill section. Everybody went to work at the age of 14 or 15 and worked until they passed away at 44, 48, or so. But seriously, what can I tell John and Mary who are too young to work and too old to get started in this technological age? Work or leisure, what shall they do?

DR. DECARLO: That's a question that doesn't have one answer. I'll try to tell you a few things you might say. Let me distinguish the kinds of kids you might be talking to. I think, by and large, I would take the position that all kids should stay in school—if, at the time you tell them this, there is a 45-percent probability that they might be motivated to study 25 percent of what is exposed to them. If they are not motivated, they want to get out of school. They want to do something else. If the child is a reasonably good student and comes from the great middle class, then I would tell him to go to school and take as many subjects as he can which are mind expanding, not consciousness expanding. Consider the child in New York City in that depressed and deprived situation—the service you do him is, in a sense, a dilemma. Consider the boy in one of the New York City schools who has the belief that somehow or other he is not going to make it because of his color, because of his educational status at that point. If I tell him not to study that's the cynical view, the realistic view.

The other view says, you have to study, because that's the way out. I think it is the only way out. How you handle a child, it seems to me, is a very painful human act because you are hung

either way. You and I know that unless there are some changes, almost any advice you give that child is not sound advice. I cannot deny that. You are not going to change that. We have to change the problem. One of the ways to change it is to admit from an educational point of view in these areas that this is a materialistic society and that's a little bad. What you want to do is to guarantee John and Mary a chance to achieve some kind of dignity, some awareness of themselves that's worthwhile. That means to participate in some kind of a job that is reasonably interesting, for which they get paid.

I would like to see us start almost paying these kids in the job staging areas to do work that is needed in the city, with the proviso, not the requirement, that they somehow go back and try to pick up some more education so that they can do a little bit more. But I think, number one, that you have to guarantee them a way to participate in society which is not simply welfare. It must be something that they work at. When society makes up its mind that this needs to be done, it will take this generation of kids and use them and give them a sense of well-being upon which you can build a future. I think you will just have to level with John and Mary. Whether they come from Chicago, Scarsdale, or Harlem, I think you will get three different answers.

MR. HARRIS: I would like to comment on that from my own experience in a psychological sense. One of the things that I think is needed is some way of creating what Freud called the "security of a doubt." Nouns connote stability. Verbs connote change. Poetry, as Gertrude Stein said, is verbs. Our public school system is nouns.

I'll take my text from the Inglis lecture at Harvard in 1950 which that year was given by Margaret Mead. It is curious that she as an anthropologist should have been the one chosen to give this most distinguished annual educational lecture. In the lecture entitled "The School in American Culture," she said that if we can simply find the courage to admit to our children that in this generation we don't know what the problems are, let alone the answers, and communicate to our children this parlous state, this knowledge alone may equip them as no other generation has been equipped.

FROM THE FLOOR: I feel fairly comfortable in viewing the white-collar world of the future, considering that I am a white-collar worker with a minimum amount of education, but I am concerned about those persons in the future who will not qualify for this category. If you say that the white-collar worker is in the center, who are those persons on the outside fringes who are struggling to get in and apparently lack the capabilities either mentally or physically to do so? In carrying this a step further to Dr. Mead's statement, in one of her lectures here she said that the concept of the high school dropout is, in her words or feeling, incorrect, because there are a lot of people who just are not interested in going to college. So you should do something to reorient their thinking. The school system should prepare them for those jobs that are numerous in our economy, but don't require a college education. So here again it seems to me that there are quite a few people in this fringe area who will not be able to qualify for the white-collar situation that you described. I would like to know, how do you prepare or how do you envision them in this great plan that you have, and what can we do about it?

DR. DECARLO: By talking about a center of the white-collar worker with the production workers at the periphery, the production workers are not downgraded. Instead it suggests that the work of people in steel plants, for example, or at the hangars at LaGuardia or the machine shop, is separated from their bodies by the controls they have to handle. If you watch people move dirt around New York City in the excavations, you see that you have to have a certain level of education simply to be around machines that are transforming the physical environment. So that even blue-collar work, if I may use white and blue as a symbol, is becoming more of a process of pattern recognition and intelligence. I am trying to say that the whole work phenomena is becoming, in a sense, effete. It's moving away from our senses, even for [illegible]e times we have to be involved. It seems the only time we really need a body is when we are fitting objects in space where the tolerance or the shapes are very close. Then, in terms of how to build a system to do it, it is very expensive, because the eye and the brain are so beautifully engineered to this. My point was that all work is moving away from sweat and muscle.

Regarding the second point, how to get people involved, I would like to reject categorically the idea that there are some people who just don't want to go to college and some people who can't learn. I'll start from the assumption that unless a child is organically brain damaged, the potential is there. So that the learning for anyone is just infinite. As a matter of fact, when I think of my life in retrospect, I think I had three people who taught me. For everything else, I'm a self-made man. I developed because some few people kept me open. I just reject the idea that there are certain people who cannot learn. Therefore, if you can find ways to get to the youngster and keep him motivated, then he will fight in this society for these jobs.

FROM THE FLOOR: I don't mean to pursue the point, but I would just like to draw an analogy. When Dr. Mead spoke about some kids not wanting to go to college and dropping out of school, she made reference to the fact that it would be, in effect, useless to talk to a ghetto child about systems analysis. He has no concept of it. He has no parents who gave him any idea of this, so why encourage him to go to Harvard or to Yale. It was just something you said here that made me think perhaps you agreed. You said in answer to a question that what you would say to a kid in Scarsdale and to another in Harlem would be different.

DR. DECARLO: To say the same thing to these two children, I think, is to deny Mr. Harris' very important point, namely, you should tell the kid the truth. There is no standard answer for those children. My aim in talking to the kid is to treat him as a human being and say, "Look, you have a lot on your side, but it's a problem. You are really fighting this thing from the downside." Don't give him a lot of clichés. Tell him the truth. It's unfair to say that the public educational system has done all this damage, although actually it has produced some. Really, it's only about 50 years old as we know it today. I think it has really great resiliency, in spite of the fact that it's easy to make fun of it. I think it's a very responsive instrumentality. Sure, it doesn't respond in 1 year or 5 years, but it will respond. What we have to do is to identify the damage we have done in the cities. The damage has happened by a change in our agricultural productivity that has put people who were tied to the earth suddenly in the city, and has allowed people who

should have stayed in the city to move out. We know these problems. Why deny them? We have to look at them very squarely. That is what I am interested in. Instead of giving three different answers to three different kids, I would try to tell them what the environment is, and hopefully, I would motivate them to continue fighting to make themselves better and thereby maybe have a chance to get into one of these circles.

MR. HARRIS: One of the most interesting and incisive little essays that I have seen will probably not ever come to your attention, so I would like to summarize it for you. It's a study by Dr. Richard Bellman and others on the simulation of an initial psychiatric interview.[3] He says that in the first interview the entire course of therapy will be previewed, and whatever you talk about during perhaps 2 years will be touched on in that interview, or you won't be able to touch on it at any further point. The problem for the therapist is how to keep from prematurely shutting off the infinity of options presented to him at the beginning of the first hour. He makes an analogy by saying that if you are a good chess player, the first four or five moves will telegraph to you what the rest of the game is going to be like, whether the opponent opens with a Danish gambit or Fool's gambit, or what. The same thing applies to the Japanese game of Go. Let's apply this to learning. What shuts off? We have a system of rejections—the first time one learns one is Negro, the first time one learns he's at the bottom of the class, the first time etc. This whole system of rejections has shut off learning options and shut off learning motivations. This was formulated only a few years ago, let alone been applied analytically to the educational, experimental level. Whether the public schools will ever do this is not known.

FROM THE FLOOR: In the world as you visualize it, Dr. DeCarlo, I hope you can fill in one more small chain. In the vast number of adjustments that would have to take place, do you see a role for the labor unions and their concern about job security, seniority, and related problems, or do they become an anachronism that has no utility?

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[3] Richard Bellman, M. B. Friend, and Leonard Kurland, *On the Construction of a Simulation of the Initial Psychiatric Interview* (Santa Monica: Rand Corporation, July 1964).

DR. DECARLO: I would hate to see the labor movement disappear. It seems to me that they have become, in a sense, tools of big business. They operate like bureaucracies, the way big business does. This may be strictly my impression. They may be losing that carrying quality that led them to take the leadership. I always had the idea that maybe one of the failures of the roles of people in the labor movement was to act as an association of people in the defense and the pursuit of their worth as individuals. So it seems to me that the union movement could have moved out beyond economic benefits into guaranteeing a more active educational role. I am talking of education, not training, a more educational role for the individual membership. It could have sponsored cultural activities or more scholarships for children. In retrospect I think it's kind of tragic. It seems that everything has become institutionalized to management functions, rather than carrying human qualities. I must confess I am very naive, but I have always pictured John L. Lewis as a sort of heroic figure. I think that has gone.

FROM THE FLOOR: How about the future?

DR. DECARLO: I don't know. It seems that if labor unions go to Harvard Advanced Business School, I imagine John L. Lewis is kind of out of it.

MR. HARRIS: I think operations research calls that relationship a two-party, variable-sum game.

We are done. I thank the audience, and turn the meeting back to the chairman.

DR. ROSEN: I, for one, want you to know that I have considered my duties as chairman of this meeting a real honor and pleasure. I think we have had a discerning, intelligent, and really worthwhile discussion this afternoon. I would like to make a motion that every large corporation in the United States have a Charles DeCarlo placed upon it. In fact, not only every large corporation, but every large institution whether it's government or nongovernment.

I thank you very much and I hope you all enjoyed Dr. DeCarlo's presentation as much as I did.

August 1967

☆U. S. GOVERNMENT PRINTING OFFICE : 1967 O - 272-395

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